This Page Is Inserted by IFW Operations and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents will not correct images, please do not report the images to the Image Problem Mailbox.



From the iNTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

Assistant Commissioner for Patents United States Patent and Trademark Office Box PCT Washington, D.C.20231 ÉTATS-UNIS D'AMÉRIQUE

Date of mailing (day/month/year) 10 February 2000 (10.02.00)	in its capacity as elected Office
International application No. PCT/NL99/00303	Applicant's or agent's file reference BO 41838
International filing date (day/month/year) 18 May 1999 (18.05.99)	Priority date (day/month/year) 18 May 1998 (18.05.98)
Applicant	
OLSCHEWSKI, Armin, Herbert, Emil, August	et al

1.	The designated Office is hereby notified of its election made:
	X in the demand filed with the International Preliminary Examining Authority on:
	07 December 1999 (07.12.99)
	in a notice effecting later election filed with the International Bureau on:
2.	The election X was
	was not
	made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

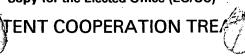
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland

Authorized officer

R. E. Stoffel

Telephone No.: (41-22) 338.83.38

Facsimile No.: (41-22) 740.14.35



PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and

From the INTERNATIONAL BUREAU

To:

DE BRUIJN, Leendert, C. Nederlandsch Octrooibureau Scheveningseweg 82

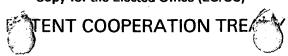
Administrative Instructions, Section 422)	P.O. Box 29720 NL-2502 LS The Hague PAYS-BAS		
Date of mailing (day/month/year) 11 September 2000 (11.09.00)			
Applicant's or agent's file reference BO 41838	IMPORTANT NOTIFICATION		
International application No. PCT/NL99/00303	International filing date (day/month/year) 18 May 1999 (18.05.99)		
The following indications appeared on record concerning: X the applicant X the inventor	the agent the common representative		
Name and Address OLSCHEWSKI, Armin, Herbert, Emil, August Nedereindseweg 121 NL-3438 AC Nieuwegein Netherlands	State of Nationality DE NL Telephone No. Facsimile No. Teleprinter No.		
The International Bureau hereby notifies the applicant that the person the name X the additional that the same the person X the same the same that the			
Name and Address OLSCHEWSKI, Armin, Herbert, Emil, August Strösselstrasse 8 D-97422 Schweinfurt Germany	State of Nationality DE DE Telephone No. Facsimile No. Teleprinter No.		
3. Further observations, if necessary:			
4. A copy of this notification has been sent to:			
X the receiving Office the International Searching Authority the International Preliminary Examining Authority	the designated Offices concerned X the elected Offices concerned other:		
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Peggy Steunenberg		

Telephone No.: (41-22) 338.83.38

Form PCT/IB/306 (March 1994)

Facsimile No.: (41-22) 740.14.35

003515480



PCT

NOTIFICATION OF THE RECORDING

From th	e INTERN	IATIONAL	BUREAU

To:

DE BRUIJN, Leendert, C.

OF A CHANGE (PCT Rule 92bis.1 and Administrative Instructions, Section 422) Date of mailing (day/month/year) 11 September 2000 (11.09.00) Applicant's or agent's file reference BO 41838	Nederlandsch Octrooibureau Scheveningseweg 82 P.O. Box 29720 NL-2502 LS The Hague PAYS-BAS		
International application No. PCT/NL99/00303	International filing date (day/month/year) 18 May 1999 (18.05.99)		
The following indications appeared on record concerning: X the applicant X the inventor Name and Address	the agent the common representative State of Nationality State of Residence		
VAN WINDEN, Johannes, Albertus Molenwal 4 NL-3421 CM Oudewater Netherlands Netherlands	NL NL Telephone No. Facsimile No. Teleprinter No.		
2. The International Bureau hereby notifies the applicant that the the person the name X the add			
Name and Address VAN WINDEN, Johannes, Albertus Mönchhofstrasse 3B D-69120 Heidelberg Germany	State of Nationality State of Residence NL DE Telephone No. Facsimile No.		
3. Further observations, if necessary:	Teleprinter No.		
4. A copy of this notification has been sent to: X the receiving Office the International Searching Authority the International Preliminary Examining Authority	the designated Offices concerned X the elected Offices concerned other:		
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Peggy Steunenberg		

Telephone No.: (41-22) 338.83.38

Facsimile No.: (41-22) 740.14.35

Nederlandsch Cotroolida		
INGEK 19 SEP 300	PATENT COOPERATION TREA	'L
I INGEK.		

Paraai Bewerken

Date of mailing (day/month/year)

11 September 2000 (11.09.00)

T

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:			

From the INTERNATIONAL BUREAU

DE BRUIJN, Leendert, C. Nederlandsch Octrooibureau Scheveningseweg 82 P.O. Box 29720 NL-2502 LS The Hague PAYS-BAS

Applicant's or agent's file reference BO 41838	IMPORTANT NOTIFICATION	
International application No. PCT/NL99/00303	International filing date (day/month/year) 18 May 1999 (18.05.99)	
The following indications appeared on record concerning: X the applicant X the inventor Name and Address	the agent the common representative State of Nationality State of Residence	
OLSCHEWSKI, Armin, Herbert, Emil, August Nedereindseweg 121 NL-3438 AC Nieuwegein	DE NL Telephone No.	
Netherlands	Facsimile No. Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the the person the name X the add		
Name and Address OLSCHEWSKI, Armin, Herbert, Emil, August Strösselstrasse 8 D-97422 Schweinfurt Germany	State of Nationality State of Residence DE DE Telephone No. Facsimile No.	
,	Teleprinter No.	
3. Further observations, if necessary:		
4. A copy of this notification has been sent to:		
X the receiving Office	the designated Offices concerned	
the International Searching Authority the International Preliminary Examining Authority	X the elected Offices concerned other:	
	Authorized officer	

Facsimile No.: (41-22) 740.14.35

The International Bureau of WIPO 34, chemin des Colombettes

1211 Geneva 20, Switzerland

Peggy Steunenberg

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

From the INTERNATIONAL BUREAU

DE BRUIJN, Leendert, C. Nederlandsch Octrooibureau Scheveningseweg 82

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)	P.O. Box 29720 NL-2502 LS The Hague PAYS-BAS		
Date of mailing (day/month/year)]		
11 September 2000 (11.09.00)			
Applicant's or agent's file reference BO 41838	IMPORTANT NOTIFICATION		
International application No. PCT/NL99/00303	International filing date (day/month/year) 18 May 1999 (18.05.99)		
The following indications appeared on record concerning: X the applicant X the inventor	the agent the common representative		
Name and Address	State of Nationality State of Residence		
VAN WINDEN, Johannes, Albertus Molenwal 4	NL NL Telephone No.		
NL-3421 CM Oudewater	relephone No.		
Netherlands Netherlands	Facsimile No.		
	Teleprinter No.		
The International Bureau hereby notifies the applicant that the person the name X the additional than the person The name X the additional than the person The name The name The person The name The			
Name and Address	State of Nationality State of Residence		
VAN WINDEN, Johannes, Albertus Mönchhofstrasse 3B	NL DE		
D-69120 Heidelberg	Telephone No.		
Germany	Facsimile No.		
	Teleprinter No.		
3. Further observations, if necessary:			
4. A copy of this notification has been sent to:			
X the receiving Office	the designated Offices concerned		
the International Searching Authority	X the elected Offices concerned		
the International Preliminary Examining Authority	other:		
7 10 10 10	Authorized officer		
The International Bureau of WIPO	Peggy Steunenheit		

1211 Geneva 20, Switzerland

Peggy Steune

Telephone No.: (41-22) 338.83.38

Facsimile No.: (41-22) 740.14.35





INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.		
BO 41838	ACTION (FORM PC 1713AV220) as well as, where applicable, item 5 below.		
International application No.	International filing date (day/month/year)	(Earliest) Priority Date (day/month/year)	
PCT/NL 99/00303	18/05/1999	18/05/1998	
Applicant			
SFK ENGINEERING & RESEARCH	H CENIRE B.V. et al.	· · · · · · · · · · · · · · · · · · ·	
This International Search Report has been according to Article 18. A copy is being tra	n prepared by this International Searching Auth Insmitted to the International Bureau.	nority and is transmitted to the applicant	
This International Search Report consists It is also accompanied by	of a total of4 sheets. a copy of each prior art document cited in this	roand.	
It is also accompanied by	a copy of each prior art document cited in this	report.	
Basis of the report			
With regard to the language, the language in which it was filed, unli	international search was carried out on the bas ess otherwise indicated under this item.	is of the international application in the	
the international search w Authority (Rule 23.1(b)).	as carried out on the basis of a translation of th	ne international application furnished to this	
b. With regard to any nucleotide an was carried out on the basis of the		ternational application, the international search	
	nal application in written form.		
filed together with the inte	filed together with the international application in computer readable form.		
furnished subsequently to this Authority in written form.			
furnished subsequently to this Authority in computer readble form.			
	the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.		
the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished			
2. Certain claims were four	nd unsearchable (See Box I).		
3. Unity of invention is lacking (see Box II).			
With regard to the title,			
the text is approved as sul	bmitted by the applicant.		
	the text has been established by this Authority to read as follows:		
	•		
5. With regard to the abstract,			
the text is approved as submitted by the applicant.			
the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.			
6. The figure of the drawings to be publi	shed with the abstract is Figure No.	1	
as suggested by the applic	cant.	None of the figures.	
X because the applicant faile	ed to suggest a figure.		
because this figure better	characterizes the invention.		

1)	•	7	7	7
	_		_		

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office	s are only
International Application No.	•
International Piling Date	
·	•
Name of receiving Office and "PCT is	nametional Application*
Applicant's or agent's file reference	BO 41838

	Applicant's or agent's file reference (f desired) (12 characters interiment) BO 41838
Box No. I TITLE OF INVENTION	
Screw actuator, and brake calliper comp	rising such actuator
BOX No. II APPLICANT	
Name and address: (Family name followed by given name; for a designation. The address must include postal code and name of an address; indicated in this flat is the applicant's State (that is, country of residence is indicated below.)	legal entity, full official surely. This person is also inventor.
SKP ENGINEERING & RESEARCH CENTRE B.V.	Telaphone No.
P.O. Box 2350	Pentimile No.
NL-3430 DT NIEUWEGRIN	
THE NEITHERLANDS	Toloprinter No.
State (that is, country) of nationality:	State (that is, country) of residence:
The Netherlands (NL) This person is applicant [38] designated [37] all designated	the Netherlands (NL) ad Susay except
This person is applicant all designated for the purposes of States X all designated the United	and States except States of America Of America only Of America only Of Supplemental Box
Box No. III PURTRIER APPLICANT(S) AND/OR (FURT	
Nume and address: (Fomily name followed by given name: for a designation, The address must include postal code and name of on	legal entity, full afficial tribits. This person is:
Nume and address: (Family name followed by given name: for a designation. The address must because postal code and name of an address indicated in this Bax is the applicant's State (that is, country of residence is indicated below.)	y) of residence (The State policent only
OLSCHEMSKI, Armin Herbert Hmil August	
Nedereindseveg 121	[X] applicant and inventor
NL-3438 AC NIEUWEGEIN THE NETHERLANDS	toventor only (If that check-box is seried, do not fill in below.)
State (that is, country) of nationality:	State (that is, country) of residence:
Germany (DE)	The Netherlands (NL)
This person is applicant all designated aff designated for the purposes of:	nd Sexua except X the United States of Assertice of Assertice only the States indicated in States of Assertice only the Supplemental Box
Further applicants and/or (further) inventors are indicated	on a continuation shoot.
Box No. IV AGENT OR COMMON REPRESENTATIVE	e or address for correspondence
The person identified below is hereby/has been appointed to set of the applicans(s) before the component International Authorities	on behalf common representative
Name and address: (Family name followed by given name: for designation. The address must include postal	e legal entity, full official Telephone No. 70 3527500
DE BRULIN, Leendert C. et al	
Nedorlandsch Octrooibureau	Festinile No. 70 3527528
Scheveningseweg 82, P.O. Box 29720 NL-2502 L8 The Hagus	/V 332/320
THE NETHERLANDS	Teleprinter No.
Address for correspondences Mark this check-box where	no agent or common representative is has been appointed and the which correspondence should be sent.
Form PCT/P(/\0) (6-m short) (bile 1908; secretar formany 1909	See Notes to the request form

Sheet No.	2.	

Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)				
If none of the following sub-house it used, this short should not be in	rinded in the request.			
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address; must be had posted exist and name of country. The country of the address indicated in this flow is the applicant's State (that is, country) of residence if no State of residence is indicated below.) KAPAAN, Herstikus Jan Waterhoen 5 NI-3435 DM NIEUWEGEIN THE NETHERLANDS	This person is: applicant only applicant and inventor inventor only (If this shock-but is marked, do not fill in below.)			
Name and address: (Family name followed by given name: for a legal entity, fell affetal designation. The address must buckede postal code and name of country. The country of the address bucked in this Ray is the applicant's Same (that is, country) of residence if no Same of residence is believed.) DRUST, Clair 283 Route la Carnalas F-73420 DRUMETTAZ CLARAFOND FRANCE	This person is: applicant only applicant and inventor inventor only (If this chackber is marked, do not fill in below.)			
State (that is, country) of assignative: France (FR)	of residence: France (FR)			
This purposes of: all designated aff designated States enough to the United States of America of	United States the States indicated in the Supplemental Box			
Name and address: Family name followed by given name; for a legal entity, full afficial disrignation. The address must include postal code and name of country. The adulty of the address indicated in this flor is the applicant's State (that is, country) of residence if he State of residence is tradicated below.) FUCKS, Thomas Wilhelm Salierallee 54 D-52066 AACHEN GERMANY	This person is: applicant only supplicant and inventor inventor only (If this check-box is marked, do not fill in below)			
State (that is, country) of nationality: GETTMETTY (DE) This person is applicant util designated util designated States except the for the purposes of: States util designated util designated States of America util designated States util designated States of America util designated States of America util designated States of America util designated States util designated util designated States util designated util designated uti	•			
Name and address: (Family name followed by given name; for a legal entity, full official designation. The padress man technic poster odds and name of country. The bountry of the address believed in this flow is the applicant's State (that is, country) of residence if no State of residence is indicated below.) EVARUS, Jacobus Carmen Laan 5 NL-3438 VA NURLWEGEIN THE NETHERLANDS	This person is: specificant early specificant and inventor inventor only (If this check-loss is marked, do not fill to below)			
State (that is, country) of nationality: The Netherlands (NL) State (that is, country) of nationality: The Netherlands (NL)	nds (NL)			
This person is applicant all designated ull designated States of America States of America	re United States the States indicated in the Supplemental Box			
Further applicants and/or (further) inventors are indicated on another continuation at	HCL.			

Charac	No.		3
311	THE .		_

Cootinuation of Box No. III FURTHER APPLICANT(5) AND/OR (FURTHER) IN	VENTOR(S)
If nowe of the following sub-besser is used, this sheet should not be inc	tuded in the request.
Nume and address: Family name followed by given name; for a legal entity, full afficial designation. The address must be tude postal code and name of country. The country of the address indicated in this Box is the applicate a State (that is, country) of residence if no State of residence is indicated below.	This person is:
WINDEN VAN, Johannes Albertus Molenwal 4	applicant and inventor
NI_3421 CM CUDEWATER THE NETHERLANDS	inventor only (I this check-has to market, the east fill in below.)
State (that is, country) of nationality: State (that is, country) of	
The Netherlands (NL) The Netherlands (NL)	
in the purposes of:	Cloring States to States indicated in America cally the Supplemental Ser
Name and address: (Family name followed by given name: for a legal entity, full afficial designation. The address must be table postal code and name of country. The country of the address tradecated in the Box is the applicant's State (that is, advantry) of residence if no State of residence to indicated below.) RINEMA, Andries Christian Leidseweg 73 NL-3531 BE UTRECHT THE NETHERLANDS	This person is: applicant only applicant and inventor because only (If this electrical is marked, so not fill in balou.)
State (that is, country) of nationality:	
The Netherlands (NL) This person is applicant	C United States the States indicated in the Supplemental Box
This person is applicant side designated states of Asperton. It for the perposes of:	America only the Supplemental Box
Nume and address: (Family name followed by given name: for a legal entity, full official designation. The names must be tude postal code and name of country. The country of the address indicated in this fact is the applicant's State (that is, country) of residence if he State (that is, country) of residence is not considered.	This person is:
Nume and address: (Family name followed by given name; for a legal entity, fell official designation, The names must because postal code and name of country. The country of the address indicated in this flor is the applicant's State (that is, country) of residence if he State of residence is indicated below.) GURKA, Jiri Peruz 290 A-4441 BEHAMBERG	expilement only spplicment and inventor inventor only (7 star check-for in marked, do not fill in below) of residence:
Numer and address: Frantly mame followed by given mane; for a lagal entity, fell official derignation, The adverses must include postal code and name of country. The adversey of the address between flow in the applicant's Shate (that is, country) of residence if he Shate of residence is indicated below.) GURKA, Jiri Petre 290 A-4441 SHHAMBERG AUSTRIA State (that is, country) of nationality: Austria (AT) This person is applicant at all designated at the purposes of:	expilement only spplicment and inventor inventor only (7 star check-for in marked, do not fill in below) of residence:
Nume and address: (Family mame followed by given name; for a legal equity, full official derignation, The address must be take posted code and name of country. The country of the address because in the applicant's State (that is, country) of residence if he State of residence is indicated below.) GURKA, Jiri Peruz 290 A-4441 BEHAMBIERG AUSTRIA State (that is, country) of nationality: Rusteria (AT) This person is applicant of state of the designment of the country) and designment of the country. The country of the state purposes of: Name and address: (Family mame followed by given names; for a legal entry of the address: address: from the purpose of the country of the address technical of the flag is the applicant's State (that is, country) of residence if no State of residence is technical below.)	spplicant and inventor inventor only (f star check-for is marked, do not fill in below) of residence:) This parama is: applicant end inventor spplicant and inventor inventor only (f star check-for is marked, do not fill in below)
Numer and address: Frantly mame followed by given mane; for a lagal entity, fell official derignation, The adverses must include postal code and name of country. The adversey of the address between flow in the applicant's Shate (that is, country) of residence if he Shate of residence is indicated below.) GURKA, Jiri Petre 290 A-4441 SHHAMBERG AUSTRIA State (that is, country) of nationality: Austria (AT) This person is applicant at all designated at the purposes of:	spplicant and inventor inventor only (f star check-for is marked, do not fill in below) of residence:) This parame is: applicant and inventor spplicant and inventor inventor only (f star check-for is marked, do not fill in below)
Nume and address: [Family name followed by given mane; for a legal entity, full official designation. The address smart include postal code and name of country). The country of the address bedoned in this flog in the applicant's State (that is, country) of residence if so State of residence is sealicated below. GURKA, Jiri Perez 290 A-4441 BRENAMBERG AUSTRIA State (that is, country) of nationality: Austria (AT) This person is applicant of states and included by given name; for a legal empire, full official designation. The address must include postal code and name of country. In country of the address included below. State (that is, country) of persons in applicant is the applicant is State (that is, country) of residence is inclinated in this flog is the applicant is State (that is, country) of residence if no State of residence is inclinated below. State (that is, country) of residence is inclinated below.	applicant and inventor inventor easy (8 ste check-for is marked, do not fill in below) of residence: This parent is: applicant only special steel inventor inventor only (8 ste check-for is acrised, do not fill in below) of residence:
Name and address: [Family name followed by given mane; for a legal again, full official designation. The address seast include postal code and name of country.] The country of the address bedone in this floor in applicant a Share (that is, country) of residence if solicated below.] GURKA, Jiri Petre 290 A-4441 REHAMBISTG AUSTRIA State (that is, country) of nationality: RIESTRIA State (that is, country) of nationality: This person is applicant States States	applicant and inventor spplicant and inventor inventor only (f star chack-for is marked, do not fill in below) Colored States

		The state of the s			
Boz N	<u>.V</u>	DESIGNATION OF STATES		<u> </u>	والمسلسد عد سب سبر بعد المسلم والمسلم
The fo	Bowh	ng designations are hereby made under Rule 4.9(a) (i	-ot	 4	कृत्याम् अस्य प्राप्त व कृताः यस स्वतः स्व स्वाप्ताः
Region			-		
63	AP .	ARIPO Patenti GH Ghane, GM Gambia, KE Kenya, 1	LS La colone	esothe State	MW Melewi, SD Sodan, SZ Sweelland, UG Uganda, of the Harare Protocol and of the PCT
	EA	Eurasian Patent: AM Armenia, AZ Aprileijan, B Moldova, RU Russian Federation, TJ Tajikistan, TM	rent	eterus eneni	stan, and any other State which is a Contracting State
63	EP .	European Patenti AT Anstria, EE Belgium, CH am DK Deumanis, ES Spain, FI Finland, FR France, GB Us MC Monaco, NL Netherlands, FT Portugal, SE Swede	ni Li nited n, m	Swit Kings deny	don, GR Grecce, IE Ireland, IT Raly, LU Lucembourg, other State which is a Contracting State of the European
22	OA	OAPI Patent: BF Burtina Paso, BJ Benia, CF Centra GA Gabon, GN Guinea, GW Guinea-Bissau, ML Maii, any other State which is a member State of OAPI and a desired smoth on depart lists			me same at man a as it and
Nades	ej Par	nt (frailer kind of protection or treatment desired, specify or	n dom	ad Ba	%
			2	LS	Leaotho
			=		Lithumia
		- Militarian			Longonous
		Annual	_		Latria
		- Company of the Comp		MD	Republic of Moldova
				MG	Madagascar
		Solution and an ambump	ă	MOK	The former Yugoslav Ropublic of Macadonia

		Bulgaria	50		Mongolia
1	BR	Brazil	=		Makwi
122		Belaus			The second secon
		Canada			
		and LI Switzerland and Liechtenstein			
	ÇN	China			New Zenland
	CU	Cuba		PL.	Poland
	CZ		2	PT	Poctugal
	DE		1	BO	Romania
	DK			RU	Russian Federation
1 2	EE			5 D	Sudan
	ES	Spain	120	SE	Sweden
	П	Pinland		SG	Singapore
. =	GB.		52	51	Slovenia
				SK	Slovakia
	GD		<u> </u>	SL	Sia-a Lagra
	CZ		23	TJ	Taillian
		Chara		TM	
			四四	TR	Teristy
		Crossia	=	TT	Trinidad and Tobago
	_		四		
		Indonesia		TIG.	
	_			UG	Uganda
<u> </u>			28	US	
153	15	losted			**************************************
	J	Japan			Uzbeldstan
		· ·		VN	• • • • • • • • • • • • • • • • • • • •
		Kyrgyzstan	区	YU	
					Zimbabwe
1 =		1	0	ock.j.	paces reserved for designating States (for the purposes of
E		R Republic of Korea	R FL	201001 18300	cases reserved for designating States (for the purposes of all patent) which have become party to the PCT atter- on this sheet:

Presentionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designations) indicated in the Supplemental Box at being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be sugarded as withdrawn by the applicant at the expiration of that thee limit. (Confirmation of a designation consists of the fibry of a notice specifies that designation and the paperse of the designation and confirmation flux. Confirmation must reach the receiving Office within the 15-month time limit.)

See Notes to the request form

LC Saint Lucia

E LK Stilents

KE Kasakhatan

M AR United Arab Emirates

.ZA.South.Africa.....

The receiving Office is requested to prepare and transmit to the International Entremational Searching of the prepared policiation of the Property for which the Collection of International application is the Property for which the Collection for the Property for the Property for White Property f			Sheet No.		
Number of surlies application (duplacethylaser) are defice application (duplacethylaser) are serviced application and serviced application (duplacethylaser) are serviced application (duplacethylaser) are serviced as serviced as serviced application are serviced as serviced	Box No. VI FILLETY CL	LAIM	Furthe	brity claims are indicated	in the Supplemental Box.
astional application: regional application: regional application: receiving Office interventional application: regional application: receiving Office interventional application: regional office interventional application: receiving Office interventional application: regional application: receiving of the receiver application in an ARIP property for which that careful for application in a receiver application in the receiver of the receiver	Filing date	Number		Where earlier applicat	
18 Maxy 1998 1009197 NIL Series (2)	of earlier application	of earlier application	munoissi applicacion-		
Seen (3) If the receiving Office is requested to prepare and transmit to the international Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s). If when the gent received expenditudes in a ALPD application is a the receiving Office) identified above as item(s). If we are more implications of all ALPD applications is it mentions for the Superimental Base of least one commy pany as the Parliament of the Protection of Industrial Property for which that certain application was fined (Base 4, 1844). See Supplemental Base (Industrial Property for which that certain application was fined (Base 4, 1844). Decided Financial Beauthing Antionies (Industrial Property for which that certain application was fined (Base 4, 1844). Decided Financial Beauthing Antionies (Industrial Property for which that certain application was fined (Base 4, 1844). Decided Financial Beauthing Antionies (Industrial Property for was fined (Base 4, 1844). Decided Financial Beauthing Antionies (Industrial Property for was fined (Base 4, 1844). Decided Financial Beauthing Antionies (Industrial Property for was fined to use results of earlier search; reference to the search (If on earlier search) for earlier search; reference or contents (Industrial Beauthing Antionies). If a JETHALETY J. 19.99 In J. J. 19.99 In J. J. 19.99 In J. J. 19.99 In J. 19.9	item (1)				
Seen (3) If the receiving Office is requested to prepare and transmit to the international Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s). If when the gent received expenditudes in a ALPD application is a the receiving Office) identified above as item(s). If we are more implications of all ALPD applications is it mentions for the Superimental Base of least one commy pany as the Parliament of the Protection of Industrial Property for which that certain application was fined (Base 4, 1844). See Supplemental Base (Industrial Property for which that certain application was fined (Base 4, 1844). Decided Financial Beauthing Antionies (Industrial Property for which that certain application was fined (Base 4, 1844). Decided Financial Beauthing Antionies (Industrial Property for which that certain application was fined (Base 4, 1844). Decided Financial Beauthing Antionies (Industrial Property for was fined (Base 4, 1844). Decided Financial Beauthing Antionies (Industrial Property for was fined (Base 4, 1844). Decided Financial Beauthing Antionies (Industrial Property for was fined to use results of earlier search; reference to the search (If on earlier search) for earlier search; reference or contents (Industrial Beauthing Antionies). If a JETHALETY J. 19.99 In J. J. 19.99 In J. J. 19.99 In J. J. 19.99 In J. 19.9	18 May 1998	1009197	NL	}	
The receiving Offices is requested to prepare and transmit to the International Bureau a certified copy of the earlies application(s) (arely if the service application for the receiving Office) (destrible which for the prepares of the presents international applications in the receiving Office) (destribled before an international application) of the receiving Office) (destribled before an international application) of the receiving Office) (destribed before an international application) of the services of the theorem of the prepares of the present international describing Authority (ISA) If you are more international Searching Authority If you are are international searching Authority If you are international S					
The receiving Office is requested to property and treatmin to the international Bureau a certified copy of the cartier application (a) (only if the cartier application was filed with the Office which for the proposes of the present international application is the receiving Office) identified above as items[1]. There are per size application of an AIMTO application is the receiving Office) identified above as items[1]. There is a particular of the international application in the receiving Office) identified above as items[1]. There is a particular application of the Property for which that cartier application was filed (Pulse 4.104)(II). See September 1800. BAY No. YII INTERNATIONAL SEARCHENG AUTHORITY Choice of International Bearching Authority (ISA) is a property on the few formation and the international description of the international application of the international application of the international application of the international application contains a property of the international application contains the following sumber of sheets: This international application contains the few formations of the particular of sheets: This international application occurred in the international application is secondary. Number Country for regiment Office is sheet of the cartier of sheets: This international application is contained in the cartier of sheets: The calculation sheets: Total number of sheets: Total sheet of security of the purported international application: Total sheet of securit	• •		ļ		j
The meanure applications () (any 9 the surface of the recent of the recent of the purposes of	item (3)				
influent the puriture applications is an ARPO application, it is amondatory to indicate in the Supplemental Base all bases on control from the Procession of	of the curver applications;	s) (any y me sarrar i n-national application	is the receiving Office) ident	tified above as born(s):	
Choice of Linternational Bearching Anthority (ISA) Received to use results of earlier search; reference to that search (if or earlier sharpes) and bearching describing describing describing describing described to describe the Description of the Description o	" Where the earlier application is Convention for the Protection of L	on ARIPO application, industrial Property for wi	it is mandatory to indicate in the idok that earther application was	Supplemental Bet at least filed (Parts 4.10(b)(10). See	one country party to the Party Supplemental Box.
SA / EPA	Box No. VII INTERNATIO	DNAL SEARCHING	AUTHORITY		
SA / EPA	Choice of International Search	hing Authority (ISA)	Request to use results of a	arlier search; reference or requested from the Inter) to that search (f an earlie material Searching Authority)
Box No. VIE CRECK LIST; LANGUAGE OF FILING This intermational application contains the following number of security. This intermational application is accompanied by the item(s) marked below: the following number of security is the microstation shoets necessary of cascingtion (excluding 5 2. copy of general power of attorney; reference number, if any: elaims : 5 4. copy of general power of attorney; reference number, if any: elaims : 5 5. priority document(s) identified in Box No. VI as item(s): drawings : 4 6. priority document(s) identified in Box No. VI as item(s): drawings : 5 copy of general power of attorney; reference number, if any: elaims shortest : 1 5. priority document(s) identified in Box No. VI as item(s): drawings in conspicuous concerning deposited microorganism or other biological material of description : nucleotide and/or amino acid sequence listing in computer readable form Total number of sheets : 20 9. dother (epacify): Copy Search report Figure of the drawings which international application: No. Item (exception) is not received in the contrastional application: No. Item (exception) is not received: not each signature, indicate the name of the person algoring and the capacity is which the person algoring the required international application: Next to each signature, indicate the name of the person algoring and the capacity is which the person algoring the required international application: 1. Engage of the favor of the contrast of the person algoring and the capacity is which the person algoring the required international application: 1. Engage of the favor of the contrast of the person algoring and the capacity is which the person algoring the required international application: 1. Engage of the favor of the contrast of the required international application: 1. Corrected date of except quality receipt date to later but imply received papers or drawings completing the person algority date of the required corrections under PCT Article 11(2): 1. International Searching Authority		orional azurah, budicata ur code may be usud:	i _		Country (or regional Office
This international application contains the following number of sheets: 1.				SN 31448	NL NL
the following number of sheets: request					1 15 1
Society Soci			••	pasted by the Hom(s) mar	KEG DEIOW;
description (excluding part): 3. copy of general power of attorney; reference number, if any: eletating part): 4. statement explaining lack of signature securing: 5. priority decument(s) identified in Box No. VI as item(s): drawings: 4. translation of international application into (language): securing part of description: 7. separate indications concerning deposited microgramism or other biological material of description: 8. intellections concerning deposited microgramism or other biological material of description: 8. intellections concerning deposited microgramism or other biological material of description: 8. intellections concerning deposited microgramism or other biological material of description: 8. intellections concerning deposited microgramism or other biological material of description: 8. intellections concerning deposited microgramism or other biological material of description: 8. intellections concerning deposited microgramism or other biological material of the drawings which should accompany the abstract: Language of fitting of the international application: Next to each signature, testicate the name of the person signing and the capacity is which the person signing of the international application: 1. Desc of actual receipt of the purported international application: 1. Desc of actual receipt of the purported international application: 2. Drawings:		1. (SZ) 1008 (_		
statement explaining lack of signature abstract : 1	description (excluding 5	1 ~ 🗆 🛶		•	
sequence listing part of description Solid priority decomment(s) identified in Box No. VI as itom(s):					wy.
drawings : 4 6. translation of international application into (language): sequence listing part of description : separate indications concerning deposited microorganism or other biological material of description : separate indications concerning deposited microorganism or other biological material of description : S. nucleotide and/or amine acid sequence listing in computer readable form Total sureher of sheets : 20 9. S. other (speads): Copy Search report Figure of the drawings which sheaters: Language of filing of the incurational application: NL. Box Ne. DK SIGNATURE OF APPLICANT OR AGENT Next to each signature, indicate the name of the person standard and expectly in which the person signature, indicate the name of the person standard and expectly in which the person signature is not obvious from reading the required international application: Corrected date of actual receipt does to later but timely received papers or drawings completing the purported international application: Transmitted of search copy desayed international Searching Authority ISA / Corrected from the person of the required corrections under PCT Article 11(2): not received until search fee is paid.					
7. separate indications concerning deposited microorganism or other biological material of description : 8. maclooride and/or amino soid sequence listing in computer readable form 7. separate indications concerning deposited microorganism or other biological material in material sequence of sheets : 20 9. other (specify): Copy Search report: Language of filing of the international application: NL Language of filing of the international application: NL Language of filing of the international application: NL Next to each signature, indicate the name of the person signing and the capacity is which the person signs (f such capacity is not advices from reading the required international application: Next to each signature, indicate the name of the person signing and the capacity is which the person signs (f such capacity is not advices from reading the required international application: Desc of actual receipt of the purported international application: Corrected date of actual receipt does to later but timely received papers or drawings completing the purported international application: received corrections under PCT Article 1 1(2): not received corrections under PCT Article 1 1(2): not received until scarch fee is peid.			• • • • • • • • • • • • • • • • • • • •	• •	
8. melecrises and/or amino acid sequence listing in computer readable form Total sursher of skeets: 20 9. cher (specify): Copy search report Figure of the drawings which should accompany the shortest: Box No. DK SIGNATURE OF APPLICANT OR AGENT Next to each signature, indicate the name of the person signing and the capacity is which the person sign (if such capacity is not obvious from reading the required international application; 1. Date of actual receipt of the purported international application; 3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application; 4. Date of timely receipt of the required corrections under PCT Article 11(2); 5. International Searching Authority [SA /					or other biological materix
Figure of the drawings which should accompany the abstract: Language of filing of the international application: NL	of description :			•	
Figure of the drawings which should accompany the abstract: Box No. DK SIGNATURE OF AFFLICANT OR AGENT Next to each signature, indicate the name of the person signing and the capacity is which the person signing the requirement of the person signing and the capacity is which the person signing the requirement of the person signing and the capacity is which the person signing from reaching the requirement of the person signing and the capacity is which the person signing from reaching the requirement of the person signing and the capacity is not obvious from reaching the requirement of the person signing and the capacity is not capacity is not obvious from reaching the requirement of actual receipt does to later but timely received papers or drawings completing the purported international application: 4. Date of timely receipt of the required corrections under PCT Article 11(2): 5. International Searching Authority ISA / (If two or more are compensate): ISA / International search fee is paid.		0.45	or (mentify); Copy sear	ch report	
Street to each signature, indicate the name of the person signing and the capacity in which the person signing the required process of the person signing and the capacity in which the person signing the required process of the person signing and the capacity in which the person signing to make the required person signing and the capacity in which the person signing the required person signing of the person signing and the capacity in which the person signing to the person signing and the person signing of the person signing and the person signing of the person signi				· · · · · · · · · · · · · · · · · · ·	
Next to each signature, indicate the name of the person signing and the capacity in which the person signing (if each capacity is not obvious from reading the requirements). Next and a capacity is not obvious from reading the requirements of actual receipt of the purported international application: 2. Drawings: Transmitted of search copy delayed of the required corrections under PCT Article 11(2): International Searching Authority (if two or more are competent): ISA /	should accompany the abstract	t	international application:	NL.	
Nederlandsch Octroolbureau The Hegue May 18, 1999 1. Date of actual receipt of the purposed international application: 3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purposed international application: 4. Date of timely receipt of the required corrections under PCT Article 11(2): 5. International Searching Authority ISA / (if two or more are competent): ISA / 6. Transmittal of search copy delayed until search fee is paid.	BOY No. DK SIGNATURE	OP APPLICANT O	R AGENT		
Nederlandsch Octroolbureau The Hegue May 18, 1999 1. Date of actual receipt of the purposed international application: 3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purposed international application: 4. Date of timely receipt of the required corrections under PCT Article 11(2): 5. International Searching Authority ISA / (if two or more are competent): ISA / 6. Transmittal of search copy delayed until search fee is paid.	Next to each signature, indicate the t	name of the person signing	and the capacity in which the purso	on algres (if such capeally is not	ne maper
1. Date of actual receipt of the purported international application: 3. Corrected date of actual receipt due to later but timely received purported international application: 4. Date of timely receipt of the required corrections under PCT Article 11(2): 5. International Searching Authority (if two or more are competent): ISA / 6. Transmittal of search copy delayed until search fee is paid.			PA	JORRITSMA, R.	•
1. Date of actual receipt of the purposed international application: 3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purposted international application: 4. Date of timely receipt of the required corrections under PCT Article 11(2): 5. International Searching Authority ISA / (if two or more are competent): ISA / 6. Transmittal of search copy delayed until search fee is paid.	Nederlandsch Octr	ooibureau The	May 18	, 1999	
international application: 3. Corrected date of actual receipt due to later but timely received papers or drawings corapleting the purported international application: 4. Date of timely receipt of the required corrections under PCT Article 11(2): 5. International Searching Authority ISA / (if two or more are competent): ISA / 6. Transmittal of search copy delayed until search fee is paid.			For receiving Office use on	y	
timely received papers or drawings completing the purported international application: 4. Date of timely receipt of the required corrections under PCT Article 11(2): 5. International Searching Authority ISA / (if two or more are compensed): ISA / 6. Transmittal of search copy delayed until search fee is paid.	international application:				
corrections under PCT Article 11(2): 5. International Searching Authority (if two or more are competent): ISA / G. Transmittal of search copy delayed until search fee is paid.	timely received papers or	drawings completing			
(if two or more are competent): ISA / LJ until search fee is paid.	4. Date of timely receipt of the corrections under PCT Ar	he required rticle 11(2):			Bot received
For International Bureau use only	5. International Searching At (if two or more are compe	uthority ISA /			tyred
		P	or international Bureau use o	nly	

Date of receipt of the record copy by the international Bureau: Form PCT/RO/101 (last sheet) (July 1998)

See Notes to the request form

J. PUV. COOO I

This sheet is not part of and does not count as a sheet of the international application.

·	CT	For receiving Office use only
FEE CALC	ULATION SHEET to the Request	International application No.
Applicant's or agent's file reference	BO 41838-400	Date stamp of the receiving Office
Applicant	SKF Engineering & F	esearch Centre B.V.
CALCULATION OF PRES	CRIBED FEES	T T
1. TRANSMITTAL FEE .		
2. SEARCH FEE		2476
International search to be fif two or more International discritos, indicate the name	Carried out by EEPO Secreting Authorities are computed in relating the Authority which in chosen to carry out the	ion to the intermetional intermetional search.)
3. INTERNATIONAL FEE	•	
Basic Fee The international applicat	ion conceins 20 sheets.	
first 30 sheets	910	
×		b2
remaining sheets	dditional amount	910 B
Add amounts ensured at b	l and b2 and enter total at B	910
Designation Fees 'The international applica	tion contains <u>all</u> designations.	
10 number of designation (to payable (ineximum 11)		2090
A did amount answered at E	3 and D and enter total at I Stores are entitled to a reduction of 75% o coppicantis (or all applicants are) so entitle % of the sum of the amounts entered at B an	3000 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
4. FEE FOR PRIORITY D	OCUMENT (if applicable)	····· L
	_	5586
5 TOTAL TEES PAYABL	T. S. I and P. and enter total in the TOTA	
The designation foct i	ire not paid at this time.	
MODE OF PAYMENT		i
without account (see	below) bank draft cash revenue stamps	other (specify).
DEBOSIT ACCOUNT AL	THORIZATION (this made of navnu	m may not be uvullable of all receiving Offices;
the RC. NL X	is hereby authorized to charge the total	leas judicated space to tak ashazit seconur.
. 🔀	demonst Greenstoff	ciency or credit any overpayment to the first fives indicated ahove to my
. 🗓	is hereby authorized to charge the fee for Bureau of WIPO to my deposit account	r preparation and transmitted of the priority document to the International
16 2 0 0	MBY 18, 1999	JANSSEN, F.H.J.F.
15.3.0/0 Deposit Account No.	Date (determinal) veter	Signature



PATENT COOPERATION TREATY PCT

į	REC'D 23	JUN 2000
L	WIPO	PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

• •	•	ent's file reference	FOR FURTHER ACTIO		cation of Transmittal of International ry Examination Report (Form PCT/IPEA/416)
BO 418	838				
Internation	onal app	lication No.	International filing date (day/n	nonth/year)	Priority date (day/month/year)
PCT/NL99/00303			18/05/1999		18/05/1998
F16D6	55/16	ent Classification (IPC) or	national classification and IPC		
Applican SFK E		EERING & RESEAR	CH CENTRE B.V. et al.		
1. Thi	is interr d is trar	national preliminary exa nsmitted to the applicar	amination report has been preport according to Article 36.	ared by this Int	ternational Preliminary Examining Authority
2. Thi	is REP	ORT consists of a total	of 5 sheets, including this cov	er sheet.	
Ø	been	amended and are the	nied by ANNEXES, i.e. sheets basis for this report and/or she n 607 of the Administrative Inst	ets containing r	on, claims and/or drawings which have rectifications made before this Authority the PCT).
The	ese an	nexes consist of a tota	l of 10 sheets.		
3. Th	_		relating to the following items:		
	C	•	of opinion with regard to novelt	v inventive ster	n and industrial applicability
	111 ∟ IV □	Lack of unity of inve		y, inventive ste	p and induction approaching
		Reasoned statemer		d to novelty, in	ventive step or industrial applicability;
,	vı 🗆	Certain documents			
\ \	/II 🗆	Certain defects in th	ne international application	٠	
·	'III ⊠		s on the international application	on	
Date of	submis	sion of the demand	Da	ite of completion	of this report
07/12/	/1999		20	.06.2000	
	nary exa	ing address of the internat	ional Au	thorized officer	September 1997 Septem
9	<i>ill</i> p.	rropean Patent Office 80298 Munich II. +49 89 2399 - 0 Tx: 52		illebrand, S	
_					

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/NL99/00303

I. Basis of th report

1. This report has been drawn on the basis of (substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.):

	Des	cription, pages:				
	2		as originally filed			
	1,3-	5	as received on	02/05/2000	with letter of	02/05/2000
	Clai	ms, No.:	•			
	1-6,	17-24	as originally filed			
	7-16	6,25-34	as received on	02/05/2000	with letter of	02/05/2000
	D-0	wingo choote:				
		wings, sheets:				1010710000
	1/3-	3/3	as received on	19/05/2000	with letter of	19/05/2000
2.	The	amendments have	e resulted in the cancellation of:			
		the description,	pages:			
		the claims,	Nos.:			
		the drawings,	sheets:			
3.		This report has be considered to go	een established as if (some of) to beyond the disclosure as filed (F	ne amendmer Rule 70.2(c)):	nts had not been made	e, since they have been
4.	Adc	litional observation	s, if necessary:			

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/NL99/00303

V. R asoned statement under Articl 35(2) with r gard to novelty, inv ntiv step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)

Yes:

Claims 1-34

No:

Claims

Inventive step (IS)

Yes: No: Claims 1-34 Claims

Industrial applicability (IA)

Yes:

Claims 1-34

No: Claims

2. Citations and explanations

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

EXAMINATION REPORT - SEPARATE SHEET

Reference is made to the following documents:

D1: GB-A-2 291 949 D2: EP-A-0 275 783.

Re Item V

The subject-matter of first independent claim 1 meets the requirements of Article 1. 33(1) PCT.

D1 discloses as closest prior art an nut-screw type actuator according to the preamble of claim 1 (see Fig. 1).

From this known actuator, the subject-matter of claim 1 differs in that the nut is fixed into the housing, thereby supporting rotatably the screw by means of rolling elements.

Thus, the subject-matter of claim 1 is new in the sense of Article 33(2) PCT.

The problem to be solved by the present invention can be considered as providing an actuator with compact design. Since the nut is fixed, no further rotational bearing is necessary for the screw, and due to this omission of a part, the actuator is more compact.

Among the cited documents, only D2 shows an actuator wherein the screw (15) effects simultaneously a rotational and a translational movement with regard to the housing. The nut (13), however, is not fixed, but additionally rotating in order to further reduce the translational speed of the screw (see Fig. 3, column 9, lines 3 to 50).

Therefore, the subject-matter of claim 1 is not derivable in an obvious manner from the prior art and involves, thus, an inventive step in the sense of Article 33(3) PCT.

Dependent claims 2 to 29 relate to further embodiments of the invention according 2. to claim 1;

consequently, their respective subject-matter meets also the requirements of Article 33(1) PCT.

- 3. Second, third and fourth independent claims 30, 31 and 34 relate to a brake calliper, a continuously variable transmission and a clutch, respectively, each of these comprising an actuator according to claim 1; therefore, their respective subject-matter meets the requirements of Article 33(1) PCT.
- Dependent claims 32 and 33 relate to further embodiments of the transmission according to claim 31;
 consequently, their respective subject-matter meets also the requirements of Article 33(1) PCT.

Re Item VIII

5. Claim 6 is not clear due to its incorrect back-reference (Article 6 PCT).

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶: F16D 65/16, F16H 25/22, 61/38, B60T 13/74

Aī

(11) International Publication Number:

WO 99/60285

(43) International Publication Date: 25 November 1999 (25.11.99)

(21) International Application Number:

PCT/NL99/00303

(22) International Filing Date:

18 May 1999 (18.05.99)

(30) Priority Data:

1009197

18 May 1998 (18.05.98)

NL

(71) Applicant (for all designated States except US): SKF ENGINEERING & RESEARCH CENTRE B.V. [NL/NL]; P.O. Box 2350, NL-3430 DT Nieuwegein (NL).

(72) Inventors; and

(75) Inventors/Applicants (for US only): OLSCHEWSKI, Armin, Herbert, Emil, August [DE/NL]; Nedereindseweg 121, NL-3438 AC Nieuwegein (NL). KAPAAN, Henrikus, Jan [NL/NL]; Waterhoen 5, NL-3435 DM Nieuwegein (NL). DRUET, Clair [FR/FR]; 283, route la Carnalaz, F-73420 Drumettaz Clarafond (FR). FUCKS, Thomas, Wilhelm [DE/DE]; Salierallee 54, D-52066 Aachen (DE). ZWARTS, Jacobus [NL/NL]; Carmenlaan 5, NL-3438 VA Nieuwegein (NL). VAN WINDEN, Johannes, Albertus [NL/NL]; Molenwal 4, NL-3421 CM Oudewater (NL). RINSMA, Andries, Christian [NL/NL]; Leidseweg 73, NL-3531 BE Utrecht (NL). GURKA, Jiri [AT/AT]; Penz 290, A-4441 Behamberg (AT).

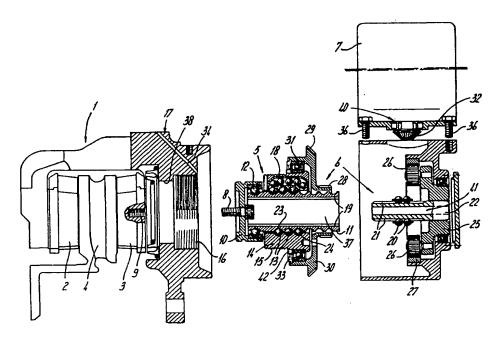
(74) Agent: DE BRUIJN, Leendert, C.; Nederlandsch Octrooibureau, Scheveningseweg 82, P.O. Box 29720, NL-2502 LS The Hague (NL).

(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published

With international search report.

(54) Title: SCREW ACTUATOR, AND BRAKE CALLIPER COMPRISING SUCH ACTUATOR



(57) Abstract

A screw actuator comprises a housing (17), a motor (7), an actuating member (10) and a screw mechanism (5) which provides a linear movement of the actuating member with respect to the housing in response to a rotational movement of the motor, which screw mechanism comprises a screw (11), a nut (14) engaging each other by rolling elements (13), one of said screw and nut being rotatably supported with respect to the housing, and a reduction gear means (6). The nut is fixed with respect to the housing, and the screw is rotatably supported with respect to the housing by means of the rolling elements.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
ΑU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
ΑZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	ТJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav	TM	Turkmenistan
BF	Burkina Faso	GR	Greece		Republic of Macedonia	TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	ΙE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JР	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	zw	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's	NZ	New Zealand		
CM	Cameroon		Republic of Korea	PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

WO 99/60285

5

10

15

20

25

30

WE FORFIG OF N

1

Screw actuator, and brake calliper comprising such actuator

The invention is related to a screw actuator, comprising an actuating member and a screw mechanism having a screw, nut and rolling elements, one of which screw and nut is rotatably supported with respect to the housing and providing a linear movement of the actuating member with respect to the housing in response to a rotational movement of the motor, and a reduction gear means.

Such screw actuator is known from WO-A-9603301. Said known screw actuator comprises a screw mechanism which is supported with respect to the housing by means of a bearing capable of accommodating axial and/or radial loads, e.g. an axial thrust bearing for accommodating the axial forces exerted on the brakepads.

This screw mechanism is a so-called roller screw mechanism. Depending on the application condition constraints i.e. space available, and load, one can select a roller screw or a ball screw type actuator. Specific application considerations for a roller screw is that such roller screw mechanism provides a high power density, which means that within specific dimensional constraints, a relatively high load carrying capacity can be provided. Said carrying capacity however is predominantly related to axial loads. With respect to radial loads, the carrying capacity is less favourable compared to a ball screw. A roller screw mechanism is in general more sensitive with respect to radial loads and misalignment.

Another specific component in a roller screw mechanism is the cage which is necessary to space the rollers. In high speed applications this cage mass results in higher starting torques.

The object of the invention is to provide an improved actuator. This object is achieved in that the nut is fixed with respect to the housing, and the screw is rotatably supported with respect to the housing by means of the rolling elements. Said rolling elements may comprise rollers or balls.

In order to obtain about the same load bearing capacity as in a roller screw mechanism, the pitch diameter of the rolling balls, the ball diameter and its contact angle with screw and nut, and the number of turns should be designed such that appropriate dimensions and the required load carrying capacity are provided. However, as the rolling elements of the screw mechanism can also act as bearing elements for supporting the rotating screw, no separate bearing is necessary to take

WO 99/60285 PCT/NL99/00303

2

up the axial load. As a result, the overall dimensions for a ball screw mechanism may remain limited in order to meet application requirements.

The ball screw mechanism is less sensitive with respect to radial loads, which makes it less vulnerable for misalignments. Also, no cage is needed for recirculation of the balls. Instead, recirculation of the balls may be obtained by means of recirculation tube or hole plug between the first and the last ball row or for each ball turn.

The axial moving and rotating screw according to the invention may be driven by the reduction gear means through a coupling means which allows axial displacements. Said coupling means may comprise a drive shaft accommodated within a bore in the screw, the surface of the drive shaft and the bore having axial grooves which engage each other through balls or splines.

10

15

20

25

30

The screw may engage the actuating member through a bearing capable to cope with radial and axial load in order to stop the rotating motion in relation to the moving actuating member.

The reduction gear means is preferably contained in a reduction gear module and the screw mechanism is contained in a screw mechanism module.

The actuating member may be executed as a piston, which is slidably held within a cylinder space of the housing. Said piston can be held non-rotatably by means of a groove and pin assembly. The motor drive module can be mounted in-line with the actuator or in angled position.

For a right angle position of the motor module, the reduction gear means may comprise one or more reduction steps with at least part of a planetary gear system having a stationary outer ring gear wheel with inwardly pointing gear teeth. In particular, the reduction gear means may comprise satellite gear wheels which mesh with the ring gear wheel and which are accommodated on a carrier connected to a rotary shaft engaging the screw mechanism, and the sun gear wheel of the planetary gear system may be accommodated on a drive shaft of the drive module. This system provides an optimal axial compactness of the application.

The sun gear wheel of the reduction gear means is connected to an angled or right angle gear reduction e.g. a bevel gear which mates with a motor driven bevel pinion. Said sun gear wheel and the bevel gear are carried out as a unitary gear wheel which is supported with respect to the nut of the screw mechanism by means

WO 99/60285 PCT/NL99/00303

3

of a rolling element bearing. In order to achieve an appropriate reduction, the pitch diameter of the bevel gear is larger than the pitch diameter of the sun gear wheel.

Furthermore, a sensor fixed on a bearing or near the motorshaft may be provided for detecting rotational and/or translational movements of the screw mechanism or other operating parameters. Also, control means may be provided, said control means having an input for a control signal, e.g. from a brake pedal, and being connected to the sensor for controlling the electric motor on the basis of the control signal and the signal from the sensor. The sensor is in particular suitable for obtaining force feedback, wear compensation and/or maintenance indication.

The actuator according to the invention can be applied for different purposes. In particular, the actuator is suitable for use in a brake calliper for an electrically actuatable disc brake, said calliper comprising an actuator as described before, and a claw piece carrying two opposite brake pads, said actuator comprising a screw and a nut one of which is rotatably supported with respect to the housing by means of an angular bearing, and a reduction gear means.

The invention will further be described with reference to the embodiments of figures 1 and 2.

Figure 1 shows a brake calliper, comprising an actuator according to the invention, in exploded view.

Figure 2 shows the brake calliper according to figure 1, in assembled state.

Figure 3 shows a detail.

10

15

20

30

Figure 4 shows a detail of the ball screw.

Figure 5 shows a further embodiment.

The brake calliper shown in figures 1 and 2 comprises a claw piece 1 carrying a fixed brake pad 2 and a displaceable brake pad 3. Said brake pads 2, 3 can be brought into co-operation with brake disc 4.

The displaceable brake pad 3 engages a ball screw mechanism 5 which by means of reduction gear means 6 is driven by motor 7. Said motor 7 may be provided with a sensor 40, connected to the motor shaft.

More in particular, the displaceable brake pad 3 is connected by means of bolt 8 and screwthreaded hole 9 to an actuating member 10. Said actuating member 10 engages the screw 11 by means of an bearing 12 capable to take up axial load. Said

15

30

actuating member is carried out as a piston 10, which is slidably, but non-rotatably held in a cylinder space 38 in the housing 17.

By means of balls 13, screw 11 engages the nut 14. Said nut 14 has an external screwthread 15, by means of which the nut 14 is connected to the housing 17. Moreover, a recirculating tube 18 for recirculating the balls 13 upon rotating the screw 11 with respect to said nut 14, extends through the nut.

The screw 11 has a bore 37 with internal grooves 19, which engage balls 20. Said balls 20 also engage the external grooves 21 of drive shaft 22.

By rotating drive shaft 22 through reduction gear means 6 and motor 7, the screw 11 is rotated as well. As a result, it is displaced backward or forward by the co-operation of its screw type groove 23 with the screw type groove 24 of the nut 14, by means of the balls 15.

Drive shaft 23 is connected to a carrier 25, which carries satellite gear wheels 26. Said satellite gear wheels 26 each engage a ring gear wheel 27 as well as a sun gear wheel 28.

Sun gear wheel 28 forms a unity with bevel gear 29 which together form a unitary gear wheel 30. Said unitary gear wheel 30 by means of bearing 31 is supported with respect to the nut 14.

The bevel gear 29 engages the bevel pinion 31, which in turn is driven by 20 motor 7.

The bearing 31, which supports the unitary gear wheel with respect to the nut 14, comprises a sensor 33 for detecting the rotations of the screw mechanism, and thereby the displacement of the displaceable brake pad 3.

Housing 17 comprises a bore 34, through which a wire can be guided to the outside from said sensor 33.

The carrier 25 is supported with respect to the housing 17 by means of bearing 35; by means of bolts 36, motor 7 is connected to said housing 17.

According to the detail of figure 3, the connection between brake pad 3 and piston 10 may alternatively be obtained through edges 43 which are slidable mounted in grooves 43 of piston 10.

In order to accommodate the axial forces exerted on the ball screw mechanism when applying a brake force on the brake pads 2,3, the screw threads 23, 24 of screw 11 respectively nut 14 can be adapted according to the embodiment shown in figure

WO 99/60285 PCT/NL99/00303

5

4. In cross-section, the threads 23 have raised parts 51, whereas the threads 24 have raised parts 52.

As a result of these shapes, the working lines 50 as defined by the contact angles and the ball conformity with the ball tracks, which define the load paths which play a role in force transfer, are in a more inclined position. The contact angle is between 45-70° in order to create optimized load carrying capacity for the ball screw in relation to the applied load specification.

5

10

15

20

25

30

The embodiment of figure 5 comprises a motor 61, having a stator 53 and a rotor 54 connected to a sleeve 55. The sleeve 55 is connected through the intermediate piece 56 to drive shaft 22. Alternatively, the sleeve 55 may be connected to the drive shaft 22 through a gear reduction.

Drive shaft 22 drives screw 11 of screw mechanism 5, through the groove 21, 19 in the respectively the drive shaft 22 and the screw 11, as well as through the balls 20 accommodated in said grooves 21, 19.

Via thrust bearing 69, the screw 11 can be connected to e.g. a brake pad in case of an actuator applied in a claw piece. The thrust bearing 69 comprises two rings 67, 68, and balls 12. One of the rings 67 may from a unity with the screw 11. The other ring 68 may comprise a locking groove 66 for locking a brake pad (not shown) thereto.

The screw 11 is rotatably and translatably held in a cylinder space 59 defined by insert ring 58 inserted in nut 14 of the screw mechanism 5. Nut 14 and screw 11 of screw mechanism 5 engage each other through balls 13, accommodated in respective screwthreaded threads of nut 14 and screw 11.

Sleeve 55 connected to rotor 54 of motor 61 is rotatably supported on the fixed nut 14 by means of bearings 63. These bearings have an outer race accommodated in the sleeve 55, and an inner ring 57 having appropriate raceways as well. The inner ring 57 is locked by means of locking ring 65. Furthermore, these bearings 63 have balls 64.

Alternatively, two separate standard ball or roller bearings may be applied. The housing of the actuator is indicated by reference number 62.

5

10

15

20

Claims

- 1. Screw actuator, comprising a housing (17), a motor (7), an actuating member (10) and a screw mechanism (5) which provides a linear movement of the actuating member with respect to the housing in response to a rotational movement of the motor (7), which screw mechanism (5) comprises a screw (11), a nut (14) engaging each other by rolling elements (13), one of said screw (11) and nut (14) being rotatably supported with respect to the housing (17), and a reduction gear means (6), characterized in that the nut (14) is fixed with respect to the housing (17), and the screw (11) is rotatably supported with respect to the housing by means of the rolling elements (13).
- 2. Actuator according to claim 1, wherein the screw (11) is rotationally driven by the reduction gear means (6) through a coupling means (19-22) which allows axial displacements.
- 3. Actuator according to claim 2, wherein the coupling means comprises a shaft (22) accommodated within a bore (37) in the screw (11), the surface of the shaft (22) and bore having axial grooves (19, 21) which engage each other through balls (20).
- 4. Actuator according to any of the preceding claims, wherein the reduction gear means (6) is contained in a reduction gear module and the screw mechanism (5) is contained in a screw mechanism module.
- 25
- 5. Actuator according to claim 4, wherein the reduction gear means (6) comprises at least two gear reduction steps.
- 6. Actuator according to claim 6, wherein the reduction gear means comprises gear reduction steps of a different type, such as a planetary gear reduction step (25-28) and a right angle gear reduction step (28-31).

WO 99/60285 PCT/NL99/00303

- 7. Actuator according to any of the preceding claims, wherein the screw (11) engages the actuating member (10) through a bearing (12) capable to carry axial and/or radial load.
- 8. Actuator according to any of claims 1-6, wherein the screw (11) is rigidly connected to the actuating member (10).
- 9. Actuator according to any of the preceding claims, wherein the actuating member is a piston (10), which is slidably held within a cylinder space (38, 59) of the housing (17).
 - 10. Actuator according to claim 7 and 9, wherein the piston (10) is held non-rotatably by means of a groove and pin assembly, or by means of a ball/groove assembly.

15

- 11. Actuator according to claims 8 and 9, wherein the piston (10) is rotatably held within the cylinder space (38).
- 12. Actuator according to claim 9, wherein the cylinder space (59) is formed 20 in the nut (14).
 - 13. Actuator according to claim 4, wherein the modules are axially aligned.
- 14. Actuator according to claim 4, wherein the modules are in laterally shifted25 positions.
 - 15. Actuator according to any of the preceding claims, wherein one or two laterally shifted motors are provided.
- 16. Actuator according any of the preceding claims 4-15, wherein the reduction gear means (6) comprises at least part of a planetary gear system having a stationary outer ring gear (27) with inwardly pointing gear teeth.

17. Actuator according to claim 16, wherein the reduction gear means comprises satellite gear wheels (26) which mesh with the ring gear (27) and which are accommodated on a carrier (25) connected to the shaft (22) engaging the screw mechanism (15).

5

18. Actuator according to claim 17, wherein the sun gear wheel (28) of the reduction gear means (6) is connected to a bevel gear (29) which mates with a motor gear, e.g. an angled or right angled gear transmission (32).

10

19. Actuator according to claim 18, wherein the sun gear wheel (28) and the bevel gear (29) are carried out as a unitary gear wheel (30) which is supported with respect to the nut (14) of the screw mechanism (5) by means of a rolling element bearing (31).

15

20. Actuator according to claim 18 or 19, wherein the pitch diameter of the bevel gear (29) is larger than the pitch diameter of the sun gear wheel (28).

20

21. Actuator according to any of the preceding claims, wherein a sensor (33) is provided for detecting rotational and/or translational movements of the screw mechanism (5).

22. Actuator according to claim 21, wherein control means are provided, said control means having an input for a control signal, e.g. from a brake pedal, and being connected to the sensor (33) for controlling the electric motor (7) on the basis of the control signal and the signal from the sensor (33).

25

23. Actuator according to claim 22, wherein the control device is arranged for providing a maintenance indication signal.

30

24. Actuator according to any of the preceding claims, wherein balls or rollers (13) of the screw mechanism (5) are coated so as to maintain the proper function of the screw (11) under dry-running conditions such as a diamond-like carbon coating.

WO 99/60285 PCT/NL99/00303

- 25. Actuator according to any of the preceding claims, wherein the motor (7) is an electric motor.
- 26. Actuator according to any of claims 1-24, wherein the motor (7) is a hydraulic motor.
 - 27. Actuator according to any of claims 1-24, wherein the motor (7) is a pneumatic motor.
- 28. Actuator according to any of the preceding claims, wherein at least one of the screw, nut, rolling elements and/or reduction gear components is obtained by hard turning.
- 29. Actuator according to any of the preceding claims, wherein the screw mechanism comprises rolling balls, and the grooves in the screw and nut are arranged for adapted contact angles in view of improved axial load bearing capacity.
 - 30. Reduction gear module for use in the actuator according to any of claims 2-27.
 - 31. Screw mechanism module for use in the actuator according to any of claims 2-27.

20

25

- 32. Drive module for use in the actuator according to any of claims 2-29.
- 33. Brake calliper for an electrically actuatable disc brake, said calliper comprising an actuator according to any of the preceding claims 1-29, and a claw piece (1) carrying two opposite brake pads (2, 3), said actuator comprising a screw mechanism (5) the screw (11) of which is rotatably supported with respect to the housing (17) by means of the balls (23) of the screw mechanism (5), a reduction gear means (6) and a motor (7).

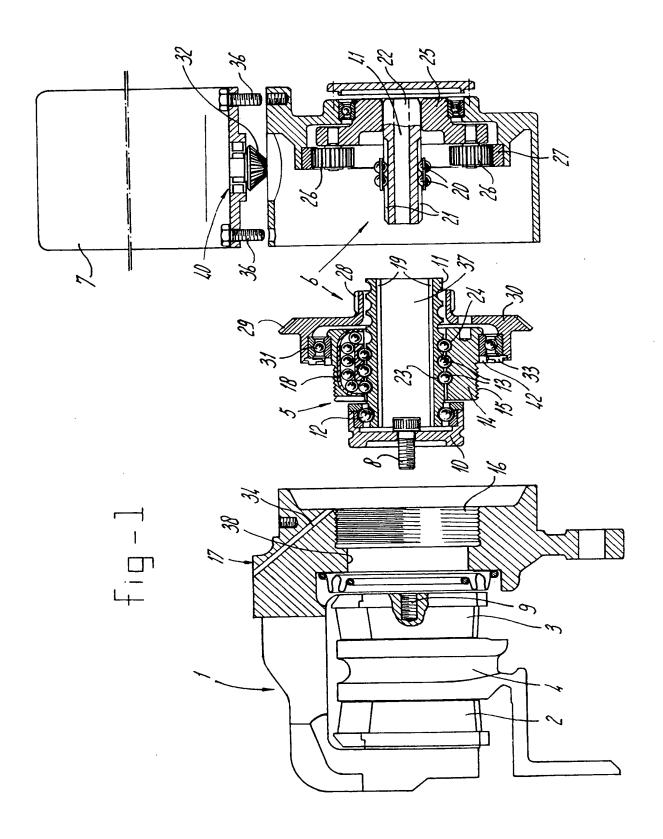
WO 99/60285 PCT/NL99/00303

10

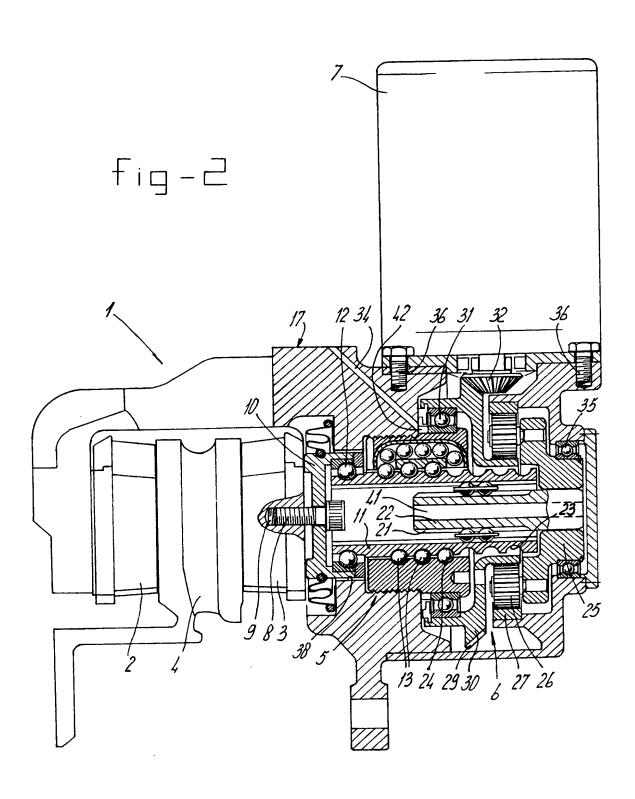
- 34. Continuously variable transmission comprising two pulleys which each have two discs enclosing a V-shaped groove, as well as a belt engaging said grooves, the discs of each pulley being movable towards and away from each other so as to continually change the running radius of the belt, wherein the discs of each pulley are displaceable by means of an actuator according to any of claims 1-29.
- 35. Continuously variable transmission according to claim 34, wherein the drive of the discs comprises hydraulic means.
- 36. Continuously variable transmission according to claim 34, wherein the drive of the discs comprises mechanical means.

5

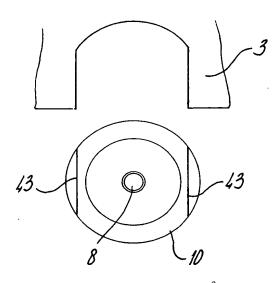
37. Clutch, comprising two clutch plates which can be brought into frictional engagement for transferring a drive couple, said clutch plates being connected to the shaft, comprising an actuator according to any of claims 1-29, said actuator having a hollow screw which accommodates one of the shafts.



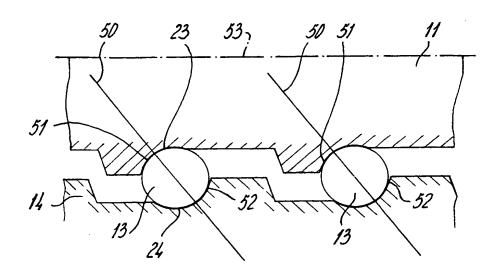
WO 99/60285



3/4

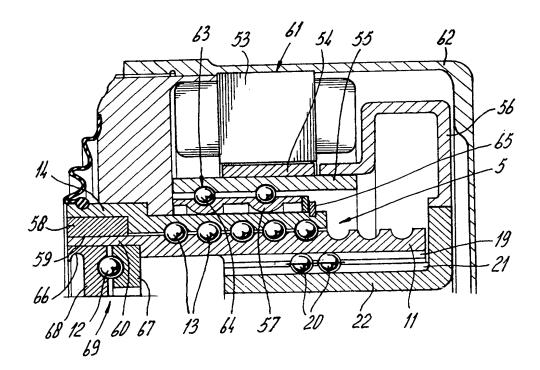


$$fig-4$$



PCT/NL99/00303

$$fig-5$$





PCT/NL 99/00303

Box III TEXT OF THE ABSTRACT (Continuation of item 5 f the first sh et)

```
The abstract is modified as follows:

line 1: after "housing" insert "(17)";
line 1: after "motor" insert "(7)";
line 1: after "member" insert "(10)";
line 2: after "mechanism" insert "(5)";
line 4: after "screw" insert "(11)";
line 4: after "nut" insert "(14)".
line 4: after "elements" insert "(13)";
line 6: after "means" insert "(6)";
```